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July 10, 2012

Ms. Demaree Collier
Remedial Project Manager
USEPA Region 5
77 West Jackson Boulevard
Chicago, IL 60604

Subject: Summary of 1,4-Dioxane Analysis Results
Residential, Plume Monitoring, and Background Wells
Lemberger Landfill Sites – First Quarter 2012

Dear Ms. Collier:

TRC Environmental Corporation (TRC), on behalf of the Lemberger Site Remediation Group (LSRG), performed the first quarter 2012 groundwater monitoring event at the LL and LTR (Lemberger Landfill Sites) between March 14 and April 11, 2012. The samples were collected and analyzed for parameters as specified in the approved Post-MNA Demonstration Project Sampling Program for the first quarter (semiannual) event, with the following program modification. In a letter dated June 1, 2011, the USEPA, in commenting on Revision 1 of the Groundwater Monitoring Plan (GMP) (RMT, April 2011), requested the addition of 1,4-dioxane to the groundwater analytical program at the Lemberger site. This compound was added because 1,4-dioxane is often found associated with trichloroethene (TCE) contaminant plumes. In response to this request, TRC proposed a one-time program modification, adding the analysis of 1,4-dioxane to the first quarter 2012 analytical program (approved by e-mail dated March 9, 2012). As a result, an aliquot of each groundwater sample collected as a part of the first quarter monitoring program was analyzed by Northern Lake Service, Inc. (NLS), located in Baraboo, Wisconsin, for 1,4-dioxane by EPA Method 522. The remaining samples were analyzed by Pace Analytical of Green Bay, Wisconsin.

TRC has prepared this memo to summarize the results of the 1,4-dioxane analysis performed on groundwater samples collected during the first quarter 2012 monitoring event. The remainder of the first quarter groundwater monitoring data will be reported in the standard quarterly data transmittal as soon as the validated data are available. The 1,4-dioxane data will be submitted electronically in the electronic data deliverable (EDD) provided to the Wisconsin Department of Natural Resources (WDNR) and the USEPA at that time.

1,4-Dioxane Analytical Results

A total of 18 residential wells and 29 groundwater monitoring wells were sampled and analyzed for 1,4-dioxane during the first quarter 2012 monitoring event. The results of the 1,4-dioxane analysis are summarized in Table 1, and presented on Figure 1. A data validation report is included in Attachment 1.

The distribution of 1,4-dioxane in the site groundwater is very similar to the distribution of other volatile organic constituents (e.g., 1,1,1-trichloroethane [1,1,1-TCA] or TCE). The reported concentrations of 1,4-dioxane exceeded the NR 140 Enforcement Standard (ES) of 3.0 µg/L at three wells, each located immediately north of the LTR Site: RM-007D (6.0 µg/L), RM-007XD (7.9 µg/L), and RM-303D (3.3 µg/L). These same three wells have historically contained the highest concentrations of 1,1,1-TCA and TCE reported in site groundwater. The extent of the ES exceedences for 1,4-dioxane in groundwater is shown on Figure 1. 1,4-Dioxane concentrations decrease downgradient (north) of the LTR facility.

1,4-Dioxane was detected at low concentrations at two of the residential wells, GR-13 (0.084 µg/L) and GR-33 (0.048J µg/L). Both of these reported results are an order of magnitude lower than the Preventive Action Limit (PAL) for 1,4-dioxane (0.3 µg/L). Well GR-33 is located almost ½ mile upgradient of the Lemberger Site.

Recommendations

Based on the results of the 1,4-dioxane analysis performed during this monitoring event, 1,4-dioxane was detected during in groundwater in the vicinity of the Lemberger site. The extent of 1,4-dioxane detections are similar to other constituents of concern at the site. Therefore, future characterization of the extent of groundwater impacts can be accomplished through the analysis of volatile organic compound analysis (VOCs by SW846 Method 8260B) that is performed routinely as a part of the approved monitoring program. TRC recommends that further sampling and analysis for 1,4-dioxane is unnecessary. Analysis of 1,4-dioxane does not provide any additional data that would serve to define plume migration or the extent of groundwater impacts at the sites.

Please call if you have questions.

Sincerely,

TRC Environmental Corporation

Kristopher D. Krause, P.E.
Senior Project Manager

Attachments

cc: Annette Weissbach and Gary Edelstein – WDNR
Douglas Clark – Foley & Lardner
Kristin Jones – Newell Rubbermaid
Nilaksh Kothari – Manitowoc Public Utilities
James Wallner – Red Arrow Products
Tim Reis – The Manitowoc Company, Inc.
John Lang, Doug Ucci – Quantum Management Group, Inc.

TABLES

Table 1
Summary of Groundwater Analytical Results for 1,4-Dioxane
March/April 2012
Lemberger Landfill Sites

SAMPLE ID	SAMPLE DATE	1,4-DIOXANE CONCENTRATION (µg/L)
Residential Wells		
GR-08	27-Mar-12	< 0.028
GR-09	27-Mar-12	< 0.028
GR-10	27-Mar-12	< 0.028
GR-10 DUP	27-Mar-12	< 0.028
GR-11	27-Mar-12	< 0.028
GR-12	29-Mar-12	< 0.028
GR-13	30-Mar-12	0.084
GR-14	2-Apr-12	< 0.028
GR-16	2-Apr-12	< 0.028
GR-26	27-Mar-12	< 0.028
GR-27	30-Mar-12	< 0.028
GR-30	30-Mar-12	< 0.028
GR-31	11-Apr-12	< 0.028
GR-33	30-Mar-12	0.048 J
GR-41	29-Mar-12	< 0.028
GR-60R	27-Mar-12	< 0.028
GR-63	2-Apr-12	< 0.028
GR-64	29-Mar-12	< 0.028
GR-64 DUP	29-Mar-12	< 0.028
GR-65	29-Mar-12	< 0.028
Monitoring Wells		
RM-002D	20-Mar-12	**0.96**
RM-003D	15-Mar-12	**2.1 j**
RM-005D	22-Mar-12	**2.5**
RM-007D	3-Apr-12	**6**
RM-007S	20-Mar-12	< 0.028
RM-007XD	23-Mar-12	**7.9**
RM-007XXD	28-Mar-12	0.056 J
RM-008D	21-Mar-12	**0.39**
RM-101D	22-Mar-12	**1**
RM-101D DUP	22-Mar-12	**0.9**
RM-103D	2-Apr-12	**0.44**
RM-103D DUP	2-Apr-12	**0.44**
RM-203D	15-Mar-12	0.18
RM-203I	15-Mar-12	0.050 J
RM-204D	4-Apr-12	**1.2**
RM-204I	4-Apr-12	**0.98**
RM-208D	23-Mar-12	**1.3**
RM-208XD	28-Mar-12	< 0.028
RM-208XD DUP	28-Mar-12	< 0.028
RM-209D	3-Apr-12	< 0.028
RM-210D	14-Mar-12	**1.8**
RM-210I	14-Mar-12	**0.72**
RM-211D	19-Mar-12	0.16
RM-211D DUP	19-Mar-12	0.14

Table 1 (continued)
Summary of Groundwater Analytical Results for 1,4-Dioxane
March/April 2012
Lemberger Landfill Sites

SAMPLE ID	SAMPLE DATE	1,4-DIOXANE CONCENTRATION (µg/L)
Monitoring Wells (continued)		
RM-212D	15-Mar-12	< 0.028
RM-212I	15-Mar-12	< 0.028
RM-213D	2-Apr-12	< 0.028
RM-214D	21-Mar-12	0.12
RM-303D	21-Mar-12	**3.3**
RM-304D	20-Mar-12	< 0.028
RM-305D	21-Mar-12	0.047 J
RM-306D	3-Apr-12	0.08
RM-307D	3-Apr-12	< 0.028

Notes:

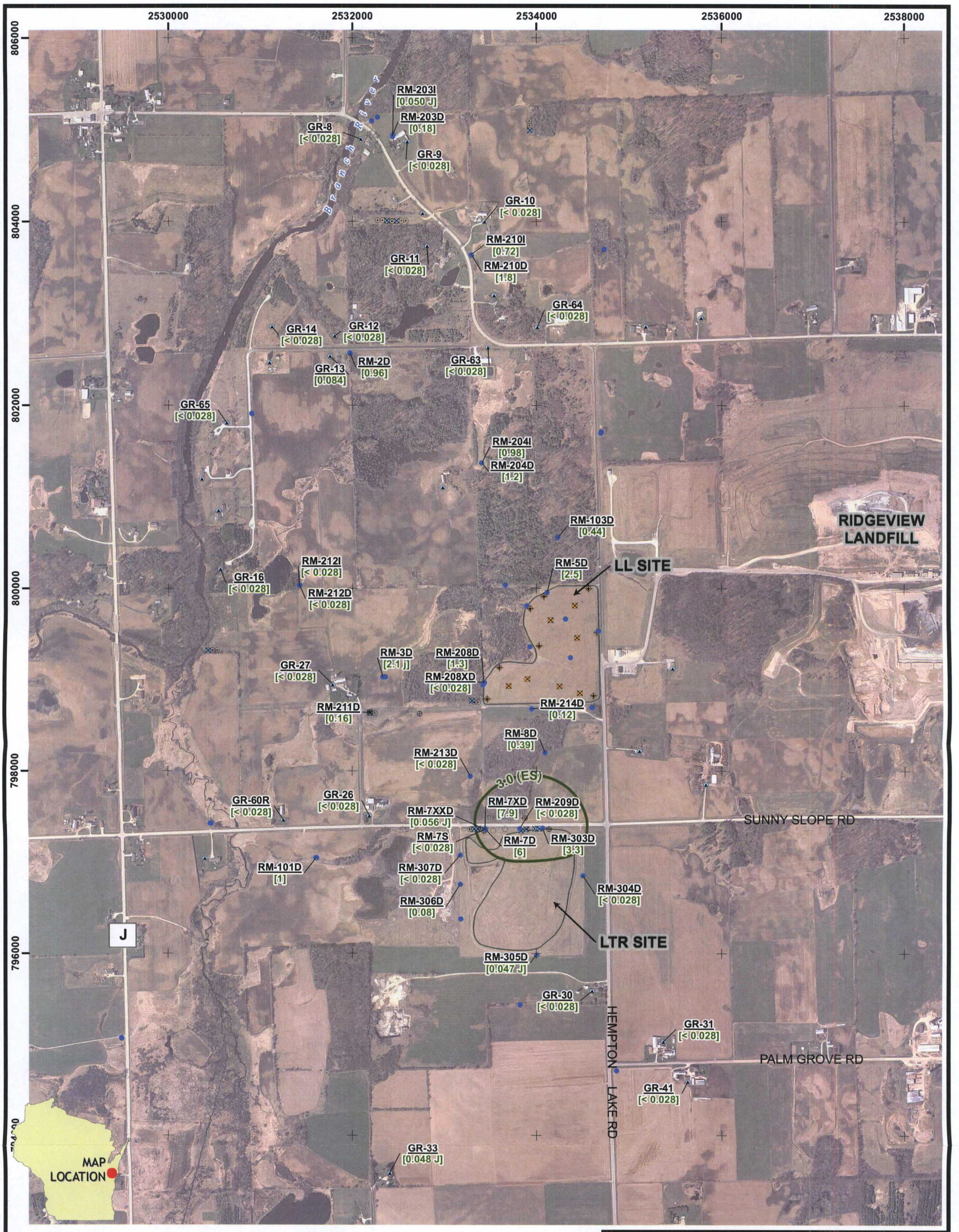
J = Reported concentration is greater than the method detection limit, but below the reporting limit. The value is considered to be estimated.

j = When specific QC criteria are outside the established control limits, the reported quantitation limit is approximate and may or may not represent the actual Limit of Quantitation necessary to accurately and precisely measure the analyte in the sample.

Shaded text indicates an exceedence of the WDNR NR 140 Enforcement Standard (3 µg/L).

Bold Text indicates an exceedence of the WDNR NR 140 Preventive Action Limit (0.3 µg/L).

FIGURES



LEGEND

- BEDROCK BORING
- GW COLLECTION SUMP (GWC)
- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- LEACHATE HEAD WELL (LH)
- LEACHATE WITHDRAWL WELL (LW)
- MONITORING WELL (RM)
- RESIDENTIAL WELL (GR)
- LANDFILL AREA
- ES — DIOXANE ISOCONCENTRATION CONTOUR ABOVE THE ES

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. MAP COORDINATES REFERENCE WISCONSIN STATE PLANE, SOUTH ZONE, NAD83, US SURVEY FOOT.
3. J = RESULT IS BETWEEN THE LOD AND LOQ.
4. j = ESTIMATED VALUE.

1 " = 1,000 ' 1:12,000 0 1,000 FEET N

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN

SHEET TITLE:
1,4-DIOXANE CONCENTRATIONS
LGU AND BEDROCK UNIT-MARCH/APRIL 2012

DRAWN BY:	PAPEZ J	SCALE:	PROJ. NO. 188040-006
CHECKED BY:	WESTOVER M	AS NOTED	FILE NO. 188040.012.diox.mxd
APPROVED BY:	WEDEKIND J	DATE PRINTED: JUL 10 2012	**FIGURE 1**
DATE:	JUNE 2012		

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Attachment 1
Data Validation Report

TRC
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Evaluation of Data Quality
1,4-Dioxane – First Quarter 2012
Lemberger Landfill Sites

July 2012

Prepared For
Lemberger Site Remediation Group

Data Quality Evaluation for 1,4-Dioxane

Data validation was accomplished by comparing the quality assurance and quality control (QA/QC) results contained in the laboratory data packages with the requirements specified in the Quality Assurance Project Plan (QAPP) for the Lemberger Landfill Remedial Design and Remedial Action (RD/RA) Workplan and the Operation and Maintenance Plan for the Lemberger Landfill and Lemberger Transport and Recycling Site, Town of Franklin, Wisconsin (Malcolm Pirnie, 1997); subsequent QAPP Addenda (RMT, 2004 and RMT, 2006); the National Functional Guidelines for Organic Data Review (USEPA, 2008); and the general guidelines contained within the laboratory Standard Operating Procedure (SOP) for USEPA Method 522, where appropriate. Particular attention was paid to Chain-of-Custody Records, initial and continuing calibrations, blanks, laboratory control samples (LCSs), duplicate analyses, matrix spikes and matrix spike duplicates (MSs/MSDs). The discussion that follows describes the results of the QA/QC activities.

Usability

TRC Environmental Corporation (TRC) collected a total of 18 private well samples, and 29 monitoring well samples in March\April 2012 for analysis of 1,4-dioxane at the wells specified in the Post-MNA Demonstration Project Sampling Program table for the first quarter sampling program. Northern Lake Service, Inc. (NLS), analyzed the samples for 1,4-dioxane by USEPA Method 522. Unfiltered samples were collected for all of the analyses.

Field blanks, MSs/MSDs, and blind field duplicates were collected and analyzed for quality control purposes. The laboratory also prepared and analyzed method (procedural) blanks, laboratory duplicates, and laboratory control spikes (LCS) for internal quality control purposes.

The data quality objectives (Malcolm Pirnie, 1997) for the project were met, and the data are usable for the purposes of the Lemberger sites. The procedures specified in the methods were implemented, and the data packages were found to contain all of the deliverables specified in the QAPP.

Sample Tracking

Laboratory reports received from NLS were compared with shipping records to confirm that results were received for each sample that was shipped. All of the results for all samples collected were received by TRC.

Holding Times and Sample Preservation

All 1,4-dioxane analyses on the groundwater samples were performed within the allowed 28 days of sample collection. All of the sample aliquots obtained for 1,4-dioxane analysis were field preserved with sodium sulfite and sodium bisulfate in accordance with the laboratory SOP.

Calibrations

Initial calibration establishes that the instrument is capable of acceptable performance at the beginning of the analytical sequence, and that the calibration curve is linear. Continuing calibration verifies the calibration and evaluates daily instrument performance.

Gas Chromatography/Mass Spectrometer (GC/MS) Calibration

Initial calibrations containing target compounds and system monitoring compounds were performed at the required frequency and concentration levels. Initial calibrations of the gas chromatography/mass spectrometer (GC/MS) at five to eight concentration levels were performed after instrument performance check criteria were met and prior to the analysis of samples and blanks. Internal standards were added to all calibration standards and samples (including blanks and MSs/MSDs). The GC/MS calibration was verified every 12 hours with one mid-range standard.

The minimum Relative Response Factor (RRF) criterion was met in the GC/MS analyses. The stability of the compound Response Factors was indicated by acceptable percent Relative Standard Deviation (RSD) or correlation coefficient (r^2) values of the RRFs. The percent difference (%D) criteria for continuing calibration were met for all calibration check compounds (CCCs) and system performance check compounds (SPCCs).

Internal Standard Responses and Retention Times in the GC/MS Analysis

The quantitative determination of 1,4-dioxane is based on the use of internal standards added immediately prior to analysis. Therefore, satisfactory internal standard responses in all calibration standards, samples, and blanks are critical.

One internal standard constituent (THF-d8) was used in the 1,4-dioxane analyses. All internal standard area counts and retention times (RTs) were within the QC limits in the analysis of samples for 1,4-dioxane.

Method Blanks

Method blanks were analyzed to assess potential sample contamination resulting from laboratory procedures. A method blank is carried through the same analytical steps (preparation and analysis) as the samples.

Method blanks were analyzed with each group of samples analyzed. The method blank analyses were performed at the frequencies required in the method. There were no target compounds detected in the method blanks analyzed for 1,4-dioxane, indicating that there was no contamination of the samples introduced through laboratory procedures.

Field Blanks

To check for procedural contamination at the site, which may cause sample contamination, three field blanks (prepared by TRC) were analyzed for 1,4-dioxane. There were no detections for 1,4-dioxane in the field blanks.

Matrix Spikes/Matrix Spike Duplicates (MSs/MSDs) and Post-Digestion Spikes and Post-Digestion Spike Duplicates (PSs/PSDs)

Matrix spikes (MSs) and matrix spike duplicates (MSDs) provide information about the effects of the sample matrix on the sample preparation and measurement performance. A matrix spike consists of a sample that is spiked with a group of target constituents representative of the method analytes and carried through the appropriate steps of the analysis, including distillation, digestion, and extraction (as appropriate). If the spike is added to the sample after the completion of sample preparation procedures, or if the sample does not undergo sample preparation procedures, it is referred to as a post-digestion spike.

Additional sample aliquots were collected at three wells RM-3D, RM-208D, and RM-7XXD, for MS/MSD analysis. All target analytes were spiked into the MS/MSD samples analyzed for 1,4-dioxane. In some instances, the percent recovery or the relative percent difference (RPD) of an analyte was outside of the laboratory control limits. In most cases, the affected analytes either were not detected in the samples or were qualified as not detected during data validation. There were no significant MS/MSD exceedences. Overall, percent recoveries were only slightly outside of the control limits. In most cases, the exceedences are believed to be the product of the tight control limits, and not the sample matrix. The MS/MSD parent samples were qualified with a "j" flag when the percent recovery or RPD for a given analyte was outside the control limits, and the analyte was detected in the parent sample. Most MS/MSD results for 1,4-dioxane met the laboratory's quality control criteria for percent recovery (accuracy), and relative percent difference (precision).

Surrogate/System Monitoring Compound (SMC) Spikes

Surrogate/SMC spikes are compounds that are similar to the analytes of interest in chemical behavior, but are not normally found in environmental samples. Laboratory performance was established by spiking each of the individual samples, blanks, and MS/MSDs prior to extraction and/or analysis; calculating the percent recovery of each surrogate compound; and comparing the recoveries to statistical limits that were derived from historical data. One surrogate compound, 1,4-dioxane-d8, was used in the 1,4-dioxane analysis. All surrogate recoveries met method requirements in the groundwater and quality control samples.

Laboratory Control Samples

Laboratory control samples (LCSs) were used to monitor the overall method accuracy of the analysis, including the sample preparation for all parameters. The laboratory performs laboratory control sample duplicates (LCSDs) as needed to evaluate the overall method precision.

The laboratory performs LCSs/LCSDs for the 1,4-dioxane analyses. The recoveries and the RPDs were within the laboratory control limits.

Blind Field Duplicate Samples

Field duplicates measure both field and laboratory precision. As expected, the variability in field duplicates is greater than it is for the laboratory duplicates, which measure only laboratory precision. Heterogeneity of samples, difficulty in replicating the analytical results from small sample aliquots, and low concentrations of analytes can all result in decreases in the precision.

Six pairs of blind field duplicates collected from wells GR-10, GR-64, RM-101D, RM-208XD, RM-103D, and RM-211D were compared against their 1,4-dioxane concentrations. Table 1 shows the comparison of the reported analytes in the duplicate pairs for detected parameters. Relative percent difference (RPD) values were calculated for only those pairs in which both reported results were above the Limit of Quantitation (LOQ) and were not qualified as not detected on the basis of blank contamination (i.e., "u"-flagged). Precision should not be evaluated for those analytes that are reported with values below the LOQ, since good precision cannot be expected at those levels. Constituents that were less than the Limit of Detection are not shown.

The precision of the groundwater samples expressed as Relative Percent Difference (RPD) is very good, with RPDs of 13 percent or less for all of the duplicate results. No data were qualified based on the field duplicates.

References

Malcolm Pirnie (with modifications by RMT). 1997. Final operation and maintenance plan, Lemberger Landfill RD/RA Operable Unit 1. February 1997.

RMT, Inc. 2004. Addendum to the quality assurance project plan. Lemberger Landfill and Lemberger Transport and Recycling Site, Town of Franklin, Wisconsin. July 2004.

RMT, Inc. 2006. Addendum to the quality assurance project plan for the monitored natural attenuation engineering demonstration project. Lemberger Landfill and Lemberger Transport and Recycling Site, Town of Franklin, Wisconsin. April 2006.

USEPA. 2008. USEPA contract laboratory program, national functional guidelines for organic data review. USEPA-540-R-08-01. June 2008.

Table 1
Duplicate Sample Relative Percent Difference (RPD) Comparisons
for 1,4-Dioxane - First Quarter 2012 Sampling Event
Lemberger Landfill Sites

PARAMETER	LIMIT OF QUANTITATION	RM-101D 3/22/2012	RM-101D DUP 3/22/2012	RPD	UNITS
1,4-dioxane	0.073	1.0	0.90	11	µg/L
PARAMETER	**LIMIT OF QUANTITATION**	**RM-103D 4/2/2012**	**RM-103D DUP 4/2/2012**	**RPD**	**UNITS**
1,4-dioxane	0.073	0.44	0.44	0	µg/L
PARAMETER	**LIMIT OF QUANTITATION**	**RM-211D 3/19/2012**	**RM-211D DUP 3/19/2012**	**RPD**	**UNITS**
1,4-dioxane	0.073	0.16	0.14	13	µg/L

Note:
– Either one or both values are less than the Limit of Quantitation or were qualified as not detected; therefore, an RPD calculation is of limited significance and was not done.

Table 2
Laboratory and Data Validation Qualifiers
Lemberger Landfill Sites

LABORATORY QUALIFIERS		
QUAL	**FRACTION**	**DEFINITION**
A	Inorganic	Analyte is detected in the method blank.
B	Inorganic	Analyte is detected in the method blank. Analyte is detected between the method detection limit and the reporting limit.
B	Organic	Analyte is detected in the method blank.
BB	Inorganic	BOD result is estimated due to the BOD blank exceeding the allowable oxygen depletion.
BI	Inorganic	BOD result is estimated due to insufficient oxygen depletion. Due to the 48-hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
DA	Inorganic	Dissolved analyte greater than total analyte; analysis passed QC based on precision criteria.
E	Inorganic	Analyte concentration exceeds the maximum linear quantitation limit of the instrument. Estimated concentration due to matrix interferences.
E	Organic	Analyte concentration exceeds calibration range.
F	Inorganic	Due to potential interferences for this analysis by ICP techniques, this analyte has been confirmed by, and reported from, an alternative method.
F	Organic	Surrogate results outside control limits.
H	Inorganic/ Organic	Extraction and/or analysis performed past the holding time.
I	Inorganic	Estimated concentration due to severe matrix interference.
J	Organic	Qualitative evidence of analyte present: Concentration detected is greater than the method detection limit but less than the reporting limit.
K	Inorganic	Sample received unpreserved. Sample was either preserved at the time of receipt or at the time of sample preparation.
L1	Organic	Laboratory control spike recovery not within control limits.
M0	Inorganic	Spiked sample recovery not within control limits.
M	Organic	Sample pH was greater than 2.
N	Organic	Spiked sample recovery not within control limits.
P	Organic	The relative percent difference between the two columns for detected concentrations was greater than 40%.
Q	Inorganic/ Organic	The analyte has been detected between the Limit of Detection (LOD) and the Limit of Quantitation (LOQ). The results are qualified due to the uncertainty of analyte concentrations within this range.

Table 2 (continued)
Laboratory and Data Validation Qualifiers
Lemberger Landfill Sites

LABORATORY QUALIFIERS		
QUAL	**FRACTION**	**DEFINITION**
S	Inorganic	The reported value was determined by the Method of Standard Addition.
UN	Inorganic	Sample was not preserved to pH < 2.0.
W	Inorganic	Post-digestion spike out of control limits.
W	Organic	Sample received with headspace.
X	Inorganic/ Organic	See Sample Narrative.
1	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analysis passed QC based on precision criteria.
2	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analysis failed QC based on precision criteria.
8	Inorganic	BOD result is estimated due to complete oxygen depletion. Due to the 48-hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
#	Inorganic	Duplicate analyses not within control limits.
&	Inorganic/ Organic	Laboratory Control Spike recovery not within control limits.
*	Inorganic/ Organic	Duplicate analyses not within control limits.
X	Inorganic/ Organic	See sample narrative for information related to these samples.
DATA VALIDATION QUALIFIERS		
b		Analyte is present in the associated trip blank.
f		Analyte is present in the associated field blank.
j		When specific QC criteria are outside the established control limits, the reported quantitation limit is approximate and may or may not represent the actual Limit of Quantitation necessary to accurately and precisely measure the analyte in the sample.
u		Analyte is present at less than 10 times the concentration in the associated trip, field, storage, and/or laboratory method blank (B) for common laboratory contaminants, or at less than 5 times the blank concentration of other compounds and is therefore qualified as nondetectable (u) according to USEPA data validation procedures.

Note:
The definitions of laboratory flags have changed over time, and flags may have different definitions for inorganic versus organic analyses. The above table represents the most comprehensive list of definitions available for the Lemberger site historical data.